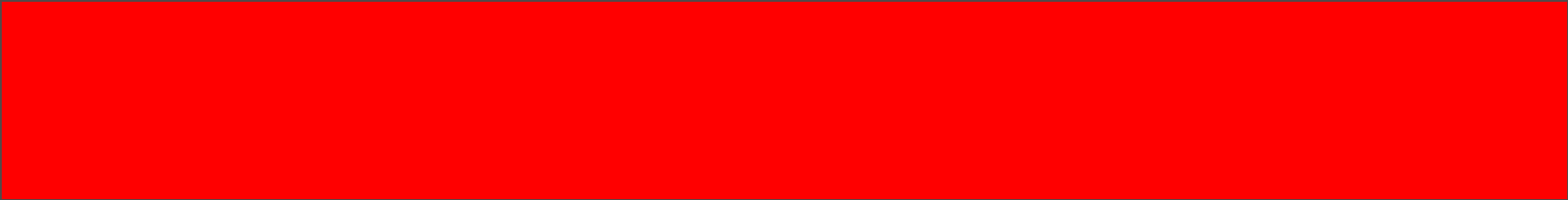


NEC

NEC

- **Necrotizing enterocolitis (NEC) is an acquired neonatal disorder representing an end expression of serious intestinal injury after a combination of vascular, mucosal, and metabolic (and other unidentified) insults to a relatively immature gut.**
- **Spontaneous intestinal perforation is a clinical syndrome of undetermined cause resembling NEC with less systemic involvement and a less severe clinical course. It may**
 - **represent a variant of classic NEC**

- 
- Why is it important to identify NEC as early as possible?

NEC is a progressive disease with mortality rates from 15-30%

(inversely related to gestational age and birth weight)

- Etiology of NEC is unclear; May be

Multifactorial

Prematurity is the single greatest risk factor

EPIDEMIOLOGY

- Occurs in 1-3 out of 1000 live births
- Males = Females
- Ethnic Incidence: Black > White

While it is more common in premature, VLBW infants (<1500g), 13% occur in term infants (often with preexisting illness).

RISK FACTORS

- VLBW infants
- Prematurity – inadequate perfusion gut mucosa
- Aggressive advancement of enteral feeding.
- Hyperosmolarity of solutions
- Bacterial overgrowth

■ Enteral Feeding

Formula is associated with higher risk of NEC

■ Disadvantages of Formula:

Higher osmolality

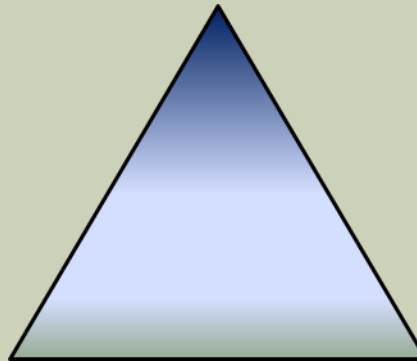
Lack of immunoprotective factors

Lack of growth factors

Altering intestinal flora

PATHOLOGY AND PATHOGENESIS

Intestinal ischemia (injury)



Enteral nutrition

Pathogenic
organisms

- **Distal part of the ileum and Proximal segment of colon are Involved most frequently**
- **In fatal cases, gangrene may extend from the stomach to the rectum.**
- **Aggressive enteral feeding may predispose to the development of NEC.**
- **Coagulation necrosis is the characteristic histologic finding of intestinal specimens**

CLINICAL PRESENTATION

- **The time of NEC onset varies inversely with gestational age.**
- **In the (VLBW) group, onset invariably follows initiation of enteral feedings and is usually diagnosed between 14 and 20 days of age.**
- **In full-term infants, age of onset is within the first week of life.**

CLINICAL PRESENTATION

- The presentation may vary from abdominal distention (the most frequent early sign, noted in 70% of cases), ileus, and increased volume of gastric aspirate or bilious aspirate (two thirds of cases) to frank signs of shock, bloody stools, peritonitis, and perforation.
- NEC may also present insidiously with nonspecific signs such as labile temperature, apnea, bradycardia, or other signs of suspect sepsis

NEC is a tentative diagnosis in any infant presenting with the triad of feeding intolerance, abdominal distention, and grossly bloody stools (hematochezia) or acute change in stool character. Alternatively, the earliest signs may be identical to those of neonatal sepsis.



LABORATORY STUDIES

- . The following should be performed as baseline studies. If there is clinical progression of disease or if these laboratory tests are abnormal, the tests should be repeated every 8-12 h.
- 1. Complete blood cell count (CBC) with differential.
- 2. Platelet count. Thrombocytopenia is seen. 50%v of NEC Pts have $PLT < 50,000/uL$.
- 3. Blood culture
- 4. Stool screening for occult blood.
- 5. Arterial blood gas measurements. Metabolic or combined acidosis or hypoxia may be seen.
- 6. Electrolyte panel., particularly hypo- or hypernatremia, and hyperkalemia are common.
- 7. Stool cultures for rotaviruses and enteroviruses should be obtained if diarrhea is an epidemic in the nursery

■ **No lab test is specific for NEC**

■ **The most common triad** □

1-Thrombocytopenia

2-Persistent metabolic acidosis

3-Severe refractory hyponatremia

RADIOLOGIC STUDIES

- 1. Flat plate x-ray studies of the abdomen
- a. Supportive for NEC. Look for abnormal bowel gas patterns, ileus, a fixed sentinel loop of bowel, or areas suspicious for pneumatosis intestinalis.
- b. Confirmatory of NEC. Look for (1) intramural bowel gas (pneumatosis intestinalis) and (2) intrahepatic portal venous gas (in the absence of an umbilical venous catheter).
- 2. Lateral decubitus and cross-table lateral studies of the abdomen. These studies are more likely to demonstrate a pneumoperitoneum.

■ Abdominal ultrasound:

- 1-Thick-walled loops of bowel with hypomotility.
- 2-□ Intraperitoneal fluid is often present.
- 3-Intramural gas can be identified in early-stage NEC31
- 4-In the presence of pneumatosis intestinalis, gas is identified in the portal venous circulation within the liver.
- 5-Color Doppler US is more accurate than abdominal radiography in depicting bowel necrosis in NEC



(pneumatosis intestinalis)



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Portal venous air is present in a patient with pneumatosis intestinalis.



DIFFERENTIAL DIAGNOSIS OF NEC

- **Specific infections (systemic or intestinal)- Pneumonia, Sepsis.**
- **Gastrointestinal obstruction, volvulus, malrotation,**
- **Isolated intestinal perforation.**
- **Severe Inherited Metabolic disorders. (e.g., galactosemia with Escherichia coli sepsis)**
- **Feeding intolerance**
- **Severe allergic colitis**
- **Idiopathic focal intestinal perforation can occur spontaneously or after the early use of postnatal steroids and indomethacin**

COMPLICATIONS

- **Intestinal perforation**
- ***Intestinal stricture**
- ***Peritonitis**
- ***Sepsis**

MANAGEMENT

■ Medical management (10-14 days)

- Make NPO, start on IVF (consider TPN).
- Insertion of nasogastric tube to suction for decompression
- Empiric antibiotics
- Ampicillin, gentamicin
- Clindamycin and/or flagyl are often added for severe cases
- Cardiovascular/pulmonary support as needed
- Pediatric surgery consultation
- Lab/radiologic monitoring:
- Q6-8 hours while patient remains acutely ill
- Check urine output every 1-2 hours
- If low, give 10-20ml/kg/hr NS

MONITORING:

- **Sequential anteroposterior and cross-table lateral or lateral decubitus abdominal x-rays to detect intestinal perforation;**
- **Serial determination of hematologic status,**
- **Serial determination of electrolyte status, and**
- **Serial determination of acid-base status**

SURGICAL MANAGEMENT

■ Absolute indication for surgery

Pneumoperitoneum

■ Relative indication for surgery

failure to improve

progressive thrombocytopenia

Portal vein gas

Severe peritonitis

Peritoneal drainage

Laparotomy with resection of affected bowel.

PROGNOSIS

- **Medical management fails in about 20–40% of patients with pneumatosis intestinalis at diagnosis; of these, 10–30% die.**
- **Early postoperative complications : Wound infection, dehiscence, and stomal problems (prolapse, necrosis).**
- **Later complications : Intestinal strictures develop at the site of the necrotizing lesion in about 10% of surgically or medically managed patients.**

PREVENTION

- Newborns exclusively breast-fed have a reduced risk of NEC.
- Early initiation of aggressive feeding may increase the risk of NEC in VLBW infants.
- Gut stimulation protocol of minimal enteral feeds followed by judicious volume advancement may decrease the risk.
- Probiotic preparations have also decreased the incidence of NEC. . Induction of GI maturation.
- Incidence of NEC is significantly reduced after prenatal steroid therapy.
- Alteration of the immunologic status of the intestine using immunoglobulin A (IgA) and immunoglobulin G (IgG) supplementation

